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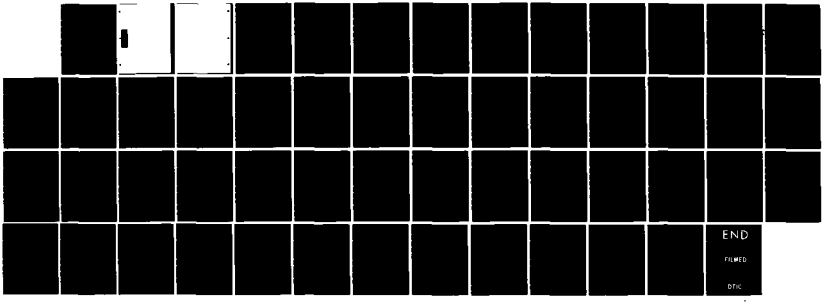

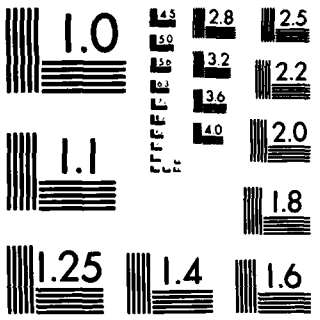

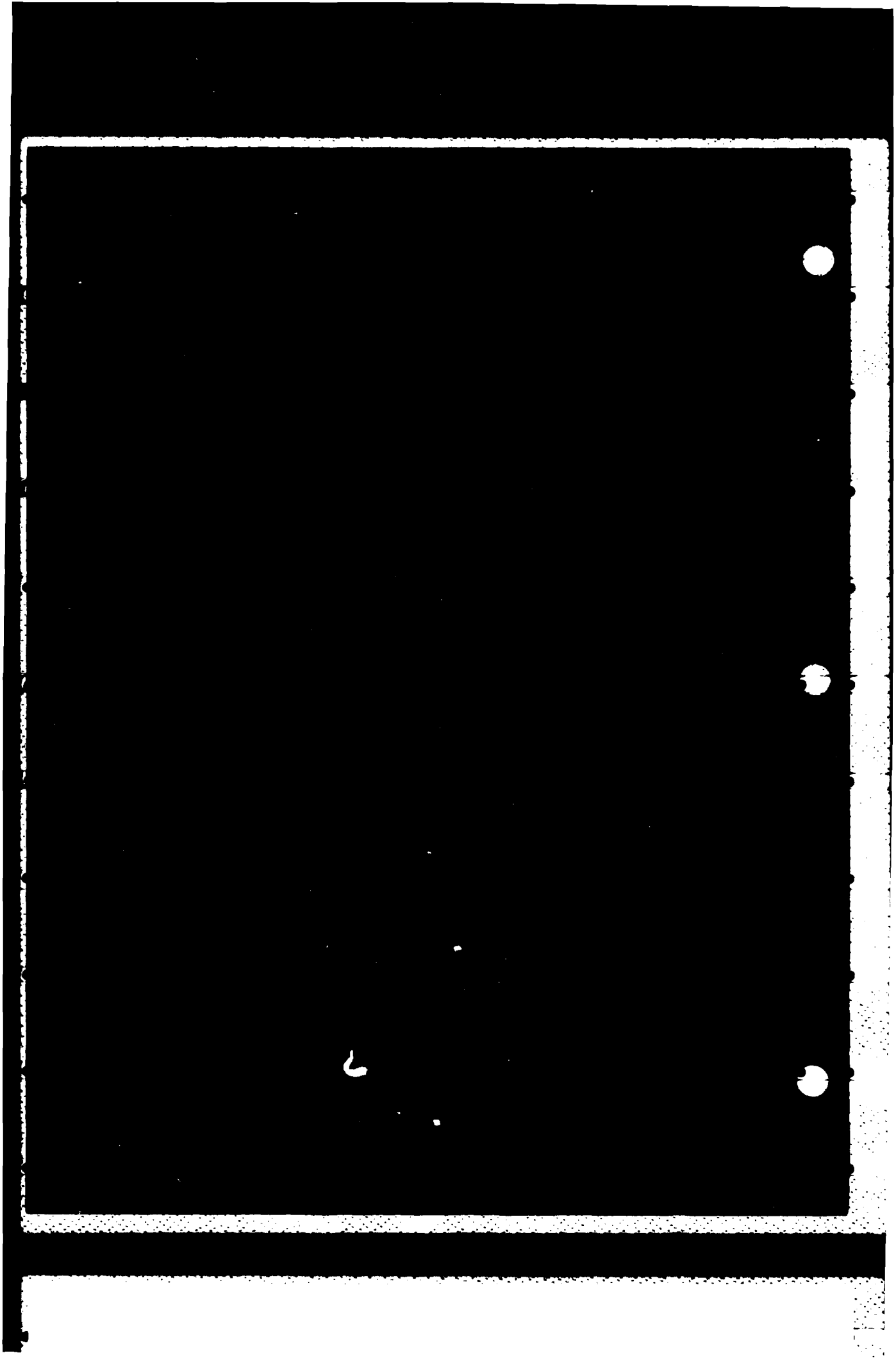

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PRIM is a computer model which distributes projected personnel inventories to projected Army jobs and measures the resulting readiness. Personnel assignment policies are simulated and the results provide the means for evaluating the long-term effects of the policies. Other PRIM publications are the PRIM Study Report ~~(CAA-SR-84-5)~~, PRIM Program Maintenance Manual ~~(CAA-D-84-2)~~ and PRIM User Manual ~~(CAA-D-84-3)~~. PRIM has been installed at the US Army Military Personnel Center (MILPERCEN).

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PERSONNEL READINESS INDICATOR MODEL

(PRIM)

DOCUMENTATION

FUNCTIONAL DESCRIPTION

NOVEMBER 1984

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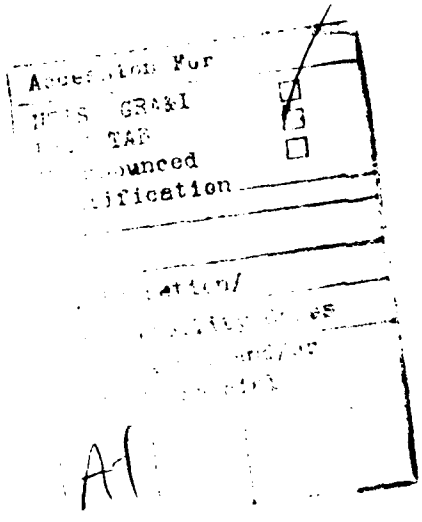

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PERSONNEL READINESS INDICATOR MODEL (PRIM) FUNCTIONAL DESCRIPTION

Section 1. GENERAL

1.1 PURPOSE. The purpose of this document is to describe the Personnel Readiness Indicator Model (PRIM) functional design. The objectives of this functional description are:

a. Provide a detailed definition of PRIM functions.

b. Define the data requirements.

c. Show the notional flow of data.

d. Identify the assumptions made in the model design.

1.2 PROJECT REFERENCES

a. Study directive, subject: Personnel Readiness Indicator Model (PRIM) Study, 26 September 1983.

b. FORECAST - a study designed to improve and replace many of the enlisted and officer inventory projections and distribution models. FORECAST does not directly address personnel readiness.

c. Army Regulation (AR) 220-1, Unit Status Reporting.

d. Personnel Readiness Indicator Model (PRIM) Program Maintenance Manual (CAA-D-84-2).

e. Personnel Readiness Indicator Model (PRIM) User Manual (CAA-D-84-3).

f. Personnel Readiness Indicator Model (PRIM) Study Report (CAA-SR-84-5).

g. The referenced policy guidance memorandums were used to determine the types of policies which should be modeled by PRIM. The PRIM design is not dependent upon the specific policies stated in the following:

(1) DCSPER Memorandum, subject: Enlisted Distribution Policy Guidance, 4 Oct 1982.

(2) DCSOPS Memorandum, subject: Policy Guidance: Personnel Fill for Force Modernization, 13 September 1982.

(3) DCSPER Letter, subject: Officer Distribution Policy Guidance FY 83, 4 October 1982.

1.3 POINTS OF CONTACT

a. Model Utilization and Model Data, Commander, Military Personnel Center ATTN: DAPC-PLF, 200 Stovall Street, Alexandria, VA 22332.

b. Model Development, Director, US Army Concepts Analysis Agency, ATTN: CSCA-FS (Personnel Systems Division), 8120 Woodmont Avenue, Bethesda, MD 20814-2797.

c. Model Operations and Maintenance, Commander, Military Personnel Center, ATTN: DAPC-PLF, 200 Stovall Street, Alexandria VA 22332.

1.4 TERMS AND ABBREVIATIONS

activity	Pay grade at an MOS at a particular demand.
AR 220-1	Unit status reporting regulation for reporting the current status of selected Active and Reserve Component units.
arc	The link between a job of a particular MOS and grade in a specific ISSUE and the number of projected inventory of a specific MOS and grade.
ASCII	American Standard Code for Information Interchange.
assignment code	Major command or DA staff agency to which the unit is assigned. The abbreviation is ASGMT.
AUDB	Authorization Data Base is the MILPERCEN-developed data base for authorizations by UIC, MOS/SC, and grade for MTOE, table of distribution and allowances (TDA), and TDA augmentation organizations.
authorized jobs	The number of jobs that should be filled during peacetime. This number is frequently constrained to a smaller number of jobs than the required jobs. Either authorized or required jobs may be specified as the jobs for PRIM.
available MOS percentage	The available MOS-trained strength divided by the required modified table of organization (MTOE) strength and converted to a percentage.

available people	Those personnel assigned to an ISSUE and who are available for duty rather than sick, on leave, or unavailable for duty for other specified reasons. For complete list see Appendix B of AR 220-1.
available senior-grade percentage	The total number of available commissioned, warrant officers, and E-5 to E-9 enlisted grades, divided by the total required number of commissioned, warrant officers, and grades E-5 to E-9 converted to a percentage.
available strength	The total available strength divided by the required MTOE strength and converted to a percentage.
CAA	US Army Concepts Analysis Agency
C-rating	The personnel readiness rating for an ISSUE based upon criteria in AR 220-1. It is the lowest of three ratings: senior grade, available MOS-trained, or available strength.
CAP III	System currently used for enlisted assignments. It has a subsystem called MAX/FIT/FILL which does the actual assignments.
CONUS	Continental United States
demand	Real job or super job
DOPMA	Defense Officers Personnel Management Act
excess people	The number of people, by MOS and grade, that have not been assigned by PRIM.
goal percentage	The minimum percentage of total aggregate fill.
high 5 high five	The highest five enlisted grades, E-5, E-6, E-7, E-8, and E-9.
inventory	See projected personnel inventories.
ISSUE	An aggregation of units for the purpose of highlighting Individual Systems, Similar Units, or Equipment.
job data	The jobs which will have personnel assigned to them by the assignment processor. The jobs are of a specific MOS or SC, grade level, and may be either required or authorized jobs.

MACOM	Major Army command
MILPERCEN	Military Personnel Center
MOS	Military occupational specialty. A code representing the type of skill in which enlisted personnel or warrant officers have been trained and should be assigned to perform. Also used in the PRIM job data file to describe the skill the person, whether enlisted or officer, assigned to a job must possess.
MTOE	Modification tables of organization and equipment
number of people	The set of combined enlisted and officer personnel available inventory.
ODCSPER	Office of the Deputy Chief of Staff for Personnel
OFIP	Officer Force Implementation Plan
parameters	Data values which are specific to each run and must be set by the user.
personnel data	The number of people (officers and enlisted) by MOS or SC grade that MILPERCEN expects will be available; the output of the P3M Model for enlisted personnel, the OFIP for commissioned officer personnel, and the WOFIP for warrant officer personnel.
personnel policies	Rules that a set of assignments should meet, i.e., DARCOM will be supported at 100 percent of officer and warrant officer authorizations for SC 51 (research and development) and SC 97 (procurement).
PNET	A mathematical programing system for solving network flow problems. It solves problems as a minimum cost network flow.
policy	In PRIM, policies are the statements of minimum and maximum fill levels which have been in effect or are being tested prior to implementation. Policies may apply to all MOS, specific MOS, or specific grade levels. Policies modeled by PRIM must be converted to computer-readable format.

P3M	Personnel Policy Projection Model is used by MILPERCEN to develop inventories for use as a personnel data. It computes an enlisted personnel inventory projection, by MOS and grade level, while taking into consideration personnel management policy options.
projected MTOE/TDA authorizations	The number of people, by specialty and grade, that will be needed in each unit (3-digit UIC) at a future time.
projected personnel inventories	The number of people, by specialty and grade, who will be in the Active Army at a future time.
required jobs	The jobs that must be filled if a unit is to achieve maximum readiness. Required MTOE jobs are used in PRIM for computation of C-ratings, IAW AR 220-1.
SC	Commissioned officer specialty code
senior grade	Personnel in grades E-5 through E-9, WO, and O1 through O6.
super job	Imaginary job where personnel are assigned when no "real" jobs are left to be filled.
super soldier	Imaginary person assigned to job when no person fitting requirements is available.
UIC	Unit identification code - A code to identify uniquely each unit of the Active Army and Army Reserve Components. Although the UIC is normally six characters, the PRIM UIC is the "3-digit UIC" (characters 2-4 of UIC) unless otherwise stated.
unavailable factor	A standard factor representing the percentage of people not available for duty, input through the Parameter file.
unfilled jobs	The jobs that have not had people assigned by PRIM.
WOFIP	Warrant Officer Force Implementation Plan

Section 2. SYSTEM SUMMARY

2.1 BACKGROUND. The introduction of new organizational systems into the Army generates major changes in the force structure. Assigning properly trained soldiers in a timely manner, coinciding with the fielding of new equipment requires intense management and long lead times. The personnel inventories required to operate future systems are, therefore, the product of today's decisions to commit resources; data for these decisions should include knowledge of future requirements. To this end, decisionmakers require a tool with which to assess the Army's ability to provide personnel support for the modernization process. The US Army Military Personnel Center (MILPERCEN) can currently project inventories by military occupational specialty/specialty code (MOS/SC) and grade for the total Active Component of the Army. However, there is not an adequate system for evaluating the impact of policy changes on the future levels of personnel fill in units. As a result, conflicting guidance may be issued, and policies may not be developed which provide the highest potential level of personnel readiness on a global basis. There is currently no way to link macrolevel MOS projections to unit-level predictions for readiness rating in the same period. The PRIM will distribute projections of Active Army personnel strengths by grade and specialty (MOS/SC) to units and logical groups of units. The PRIM reports will provide the personnel readiness measures specified in AR 220-1. In addition, other personnel information such as projected unit fill percentages will be provided. AR 220-1 specifies three types of readiness: training, equipment, and personnel. Recently, CAA developed the Effective Dates (E-DATE) Model for the Office of the Deputy Chief of Staff for Logistics (ODCSLOG); E-DATE will be used to model equipment readiness. PRIM models personnel readiness for the Office of the Deputy Chief of Staff for Personnel (ODCSPER). Currently, there is no model for training readiness.

2.2 OBJECTIVES. The Personnel Readiness Indicator Model will predict unit personnel readiness status based on AR 220-1 criteria. The PRIM will aid in determining the effects of various end strengths and distribution policies on unit readiness postures by showing the increase or decrease of the personnel fills and the resulting "C" ratings based on parameters in AR 220-1 (e.g., NCO levels and total fill). Specific objectives which were defined in the study directive are:

a. Develop the methodology for reporting projected personnel readiness indicators commensurate with the criteria of AR 220-1, of the Army units by unit identification code (UIC), and by various levels of aggregation to include major Army commands (MACOM), Continental United States (CONUS) installations, and input grouping of UICs using currently available data.

b. Develop a system which incorporates the personnel readiness indicator methodology and uses an optimizing distribution algorithm.

c. Provide MILPERCEN with documentation and training sufficient to operate the system, and assist in transferring it to a MILPERCEN computer.

d. Design model to operate on the Sperry 1100/82 computer including Phase I 80X hardware, and use only approved higher-order language such as ASCII FORTRAN or ASCII COBOL.

2.3 METHODS AND PROCEDURES

a. Input Data. The major data types required by PRIM are: (1) the enlisted personnel inventory by military occupational specialty (MOS) and paygrade; (2) the officer personnel inventory by MOS or specialty code (SC) and paygrade; (3) the number of jobs which should be filled by MOS or SC and paygrade. These automated data are created by MILPERCEN on a regular basis and are readily available for use in PRIM. In addition to the inventory and job data, the user must create four files which control the PRIM processing and the Report Request file. The control information includes the number of characters of MOS, the unit aggregations, and the policies to be modeled.

b. System Organization. The PRIM consists of six separate freestanding processors that are exercised sequentially in a batch environment to produce the final reports. Results of all processors are stored in mass storage files. The system organization is pictured in Figure 2-1.

(1) The Preprocessor creates the PRIM data base by rolling the UIC-level information on projected jobs into ISSUE-level assignment information to create the MOS-data file.

(2) The Policy Processor first applies the specific assignment policies, then creates the minimum fill levels for all other assignments to create the Job Assignment Value file.

(3) The Assignment Processor uses the Number-of-people file (from the projected inventories) and the Job Assignment Value file to create the data it requires for generating the personnel assignments.

(4) The Substitute Assignment Processor assigns excess personnel to unfilled jobs.

(5) The Readiness processor applies the criteria from AR 220-1 to develop the readiness measures and computes additional readiness indicators for use by MILPERCEN.

(6) The Report Processor provides a variety of user-designated reports.

2.4 SUMMARY OF IMPROVEMENTS. PRIM will demonstrate the feasibility of a computer model for application by ODCSPER/MILPERCEN in evaluating policy and program alternatives and the resulting impact on readiness when the expected personnel inventory is distributed to expected authorizations. Consistent with policy constraints, the model accepts MILPERCEN developed, projected inventories; distributes them to support MILPERCEN developed authorizations; and measures the result by UIC, MOS/SC, and grade. These measurements can be used for identification of potential personnel imbalances and personnel policy anomalies.

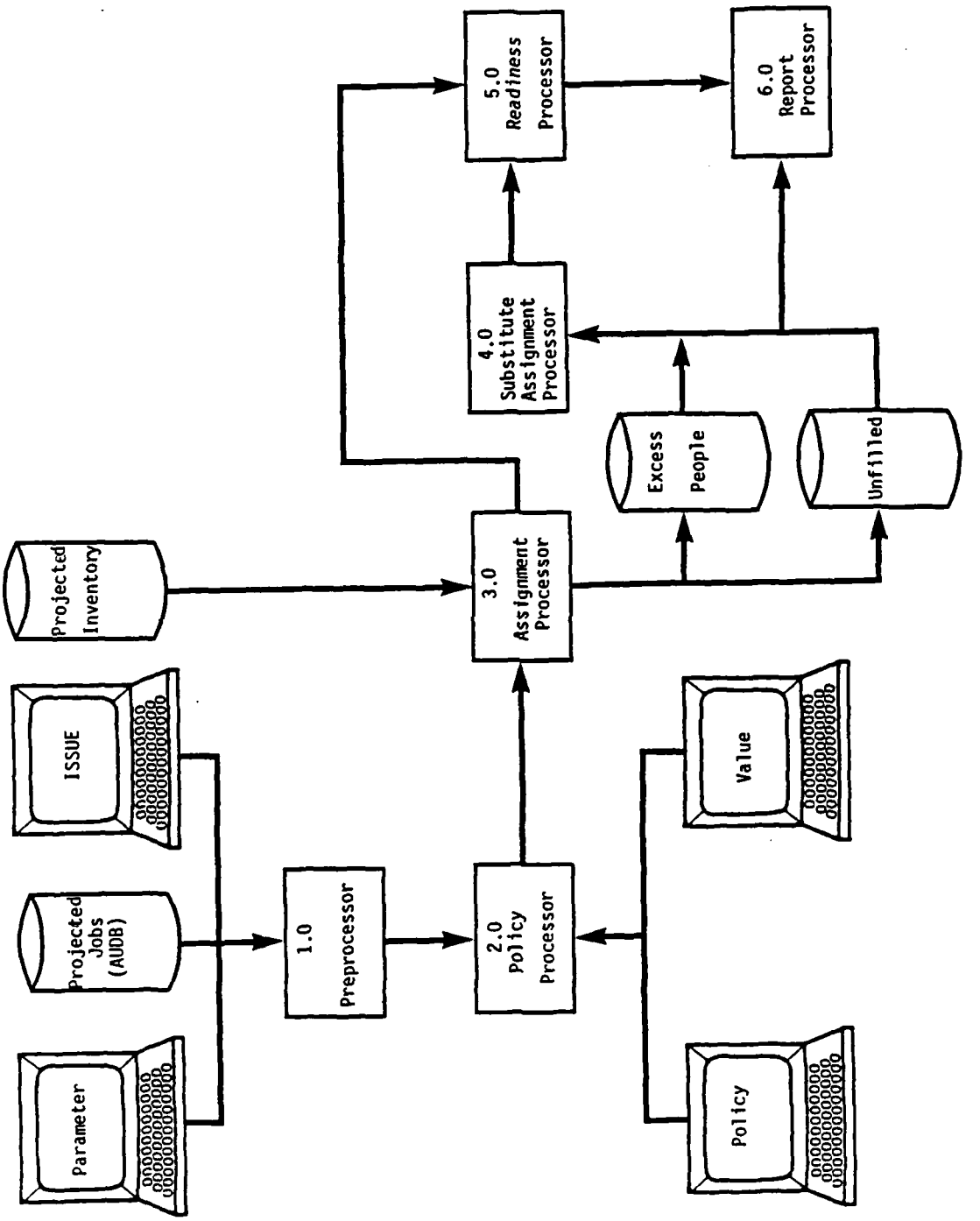

Figure 2-1. System Organization

2.5 ASSUMPTIONS AND CONSTRAINTS

a. MILPERCEN developed inventories from the Personnel Policy Projection Model (P3M) for enlisted data, from the Officer Force Implementation Plan (OFIP) for commissional officer data, and from the Warrant Officer Force Implementation Plan (WOFIP) for warrant officer data will be adequate for use as projected personnel data. The inventory data are the number of personnel available at each MOS/grade level for enlisted and warrant officers and at each SC/grade level for commissioned officers. These inventories do not include individual identification.

b. MILPERCEN developed Authorization Data Base (AUDB) authorizations by UIC, MOS/SC, and grade for all modified tables of organization and equipment (MTOE), tables of distribution and allowances (TDA), and TDA augmentation organizations will be adequate for use as assignment data.

c. No policies are modeled that cannot be stated in a standard computer-readable form.

d. If any subset (variable as desired by the user) of specific Army units can be identified and reported as individual units, it is not necessary to individually identify the entire set of Army units to any more specificity than that required to model the policies.

e. The model is designed to work with any inventory data or authorization/requirement data.

f. P3M "considers personnel management policy options," but the policies considered by P3M do not impact on the PRIM policy modeling. If they do, a different input should be developed for PRIM.

g. Active Army units and personnel data were used in testing PRIM. If the user should need to model reserve component assignments, it is assumed that PRIM will require no modification.

Section 3. DETAILED CHARACTERISTICS

3.1 SPECIFIC PERFORMANCE REQUIREMENTS. The overall validity of the model outputs is largely determined by the accuracy and validity of the input data. In addition to the personnel inventory data and the assignment data, PRIM requires several smaller files (ISSUE, Parameter, Policy, Value, and Report Request files are described in User Manual and Program Maintenance Manual) which must be created each time PRIM is run. Since PRIM is primarily table-driven, the logic for each run is provided by the user via these manually-developed files. Although PRIM prints many error and warning messages, each processor assumes that the user has already corrected all errors from the previous processor. Furthermore, it is impossible for PRIM to ensure that the user has updated the Parameter and Policy files to reflect current guidance and has correctly identified the desired issues.

3.2 SYSTEM FUNCTIONS

a. Preprocessor Organization. The Preprocessor creates the input data base aggregating UIC-level assignment information into the ISSUE MOS-data file; Figure 3-1 is a more detailed picture of the Preprocessor organization. (All figures for Section 3.2 will be found at the end of the section.)

(1) Roll to three-digit UIC. The information needed to set the ISSUE is in a file created from the header records of the AUDB. The MOS and grade information about the jobs are in a file created from the detail records of the AUDB. Both of these files must be aggregated to the three-digit (characters 2 through 4) UIC.

(2) ISSUE Rollup. This function is performed in two steps. First, the ISSUEs are associated with specific unit identification codes (UIC) using user supplied directions from the ISSUE file. If a UIC is found during the final ISSUE association (based on the first character of the assignment code) that has not been associated with an ISSUE and cannot be using the present data, an error message is written. When all UICs have been associated with an ISSUE, the second step of attaching the ISSUE to each individual assignment record is performed. A complete description of ISSUE specification may be found in Appendix A.

b. Policy Processor Organization. There are three steps within the processor. First, the Policy file is edited; second, the policies are applied to the ISSUE-level data; finally, the minimum and maximum fill levels are set for those records which did not have a specific policy stated. See Figure 3-2 for the Policy Processor organization.

(1) Policy File Edit. When errors are found in the Policy file, editing of the following policy statements continues, but the files needed for the Assignment Processor are not written. The valid policy records are rewritten for use in the Policy Application. The Policy file is edited for the following:

(a) The ISSUE code is a valid, defined code.

(b) The high-grade and low-grade values are not blank and are in the Parameter file.

(c) The high-grade value is greater than or equal to the low-grade value.

(d) The minimum and maximum fill percentages are legal values, and the maximum is not less than the minimum.

(2) Policy Application: Although policies are specified in only one file, each policy fits one of the following categories.

(a) Policies that apply to a specific MOS or SC in a specific ISSUE.

(b) Policies that apply to all MOS and SC in a specific ISSUE.

(c) Policies that apply to a specific MOS or SC in all ISSUEs.

(d) Policies that apply to all ISSUEs within a set of ISSUE aggregations.

Each of these types are divided into those that apply to specific grade(s), and policies that apply to an aggregate of a set of grades. Policy Application checks each MOS-data record against the Policy file to determine whether there is a policy that applies to the data. The computations performed depend upon whether the aggregation field was set to "YES" or to "NO."

1. **Aggregated Data.** The minimum and maximum values of the total set of assignments across the aggregated grades are set by multiplying the total number of personnel by the percentages from the Policy file. The minimum and maximum allowable fills for each grade are set by application of a different policy statement, if one was input. If not, the percentages for the aggregate are applied to each individual grade.

2. **Nonaggregated Data.** In this case, the minimum and maximum allowable fills for each grade are computed by multiplying the authorized number of people in a specific MOS and grade by the percentages from the Policy file. The minimum and maximum of the total fills are set by summing the grade minimums and maximums.

3. **Set Base Values.** In this step, all MOS-data records which have not had a specific policy applied to them are written in the correct format for the Assignment Processor using data from the Value file. This file specifies the point or step at which the value of assignments to each ISSUE changes and the values within the steps. Since this file allows input of values for assignments above the 100 percent fill level, overfills will occur for all ISSUEs which show a value for filling over 100 percent that is greater than the value specified for an unfilled job. All MOS, SC,

and grades which previously had a specific policy applied are ignored by this step.

c. Assignment Processor and Substitute Assignment Processor Organization. The majority of the PRIM assignments put personnel in jobs which match the personnel in both MOS or SC and grade. For report purposes, people who were not assigned to the correct MOS or SC and grade on the first pass of the Assignment Processor are considered excess people, and jobs that are not filled by people of the matching MOS and grade are considered unfilled jobs. The sequential steps of preparing the required network input, assigning people to jobs using the network module, and saving the resulting assignments are performed once for every MOS as shown in Figure 3-3. All personnel not assigned to a job are written to the Excess People file, and all jobs not filled are written to the Unfilled Jobs file. As shown in Figure 3-4, a second set of passes through the three steps is performed to attempt to assign all people to a job. The user designates whether MOS substitution or grade substitution should be performed first, and another set of cycles is set up for all MOS that have unfilled jobs on file. A third set of cycles is performed for the type of substitution not used on pass two. By the completion of this cycle, all people should have been assigned.

(1) Make Network Input. Since the substitution modules require slightly different logic in preparing the input for the network assignment module, this step consists of three separate, but similar, modules; one for generating the input for the original assignments and one for each type of substitution. In general, this module reads an MOS from the inventory, then locates the job requiring this MOS from the Job Assignment Value file; in the substitution modules, the inventory consists of excess people from the previously executed module and jobs are found on the unfilled job file from the previous module. Those data include the minimum and maximum number of jobs in each ISSUE and the associated value of an assignment for each paygrade. Once all information has been obtained, it is written to the Network Input file.

(a) Grade Substitution. An Excess People file and a corresponding Unfilled Job file are read. The Parameter file is read to determine which grades may be substituted for another. The only validity checks are that both grades have been specified as a valid grade; this program does not check for substitution from enlisted to officer or vice versa. Then each MOS with excess people and the unfilled jobs requiring that MOS are written to the Network Input file. Grade substitution superset names are different from superset names in the other modules.

(b) MOS Substitution. An Excess People file and a corresponding Unfilled Job file are read. The Parameter file is read to determine which MOS can be substituted for another. Up to five separate MOS can be substituted for a single MOS, and every MOS may have five possible replacements. Once all possible substitutions have been determined, all jobs requiring the MOS which must be filled with personnel of another MOS are written to the Network Input file along with the excess people data for each replace-

ment MOS. As in grade substitution, the superset names and links between jobs and people are slightly different from superset names in other modules.

(2) Network Assignment. Optimizing assignment of the inventory to the available jobs has been formulated as a network where the personnel inventory represents the resource nodes and the jobs represent the demand nodes. The number of people assigned to each job is called the flow on the arc. The values that were placed on the inventory/job pairs are the values for each assignment (for each unit of flow on the arc) and represent the preference weights. This module maximizes the sum of the preference weights while attempting to assure that at least the minimum numbers required are assigned to each ISSUE and that no more than the maximum numbers are assigned. The mathematical formulation is described in Appendix B.

(3) Save Assignments. This module reads the Network Output file to determine which job was filled. The assignments for the super soldiers determine which jobs will be considered unfilled; these are written to the Unfilled Job file. The Excess People file is determined by checking to see how many people, of which paygrades, were assigned to the super job. The number of filled jobs is the size of the flow from the inventory to the job; these are saved for later reporting. The amount of flow attributable to substitutions is saved separately from that of the original assignments. This module returns to the "make network input" module for processing the next MOS.

d. Readiness Processor Organization. The Readiness Processor computes the available strengths in each ISSUE, computes the various percentages required for MILPERCEN reports, and computes ISSUE C-ratings using the criteria in the personnel sections of AR 220-1. In order to produce the numbers MILPERCEN now reports, PRIM computes many of the percentages using the assigned personnel compared to the number of authorized spaces. In order to meet the AR 220-1 criteria, PRIM computes other percentages using available personnel and the required number of spaces. Both sets of numbers are then available for reports. Figure 3-5 provides a more detailed representation of the Readiness Processor. Table 3-1 describes the mnemonics used in this description. In all of the readiness computations, the subscript g represents the number of the computations that will be performed, and the subscript m represents a separate computation for each MOS.

(1) Compute Available Personnel. After computing the necessary aggregate numbers by summing the assigned personnel in each MOS and grade, this step uses an unavailability factor from the Parameter file to compute the number of people actually available for duty.

(a) First, using both the original assignments and the substitute assignments, compute all aggregates over all MOS and all grades:

$$AGGREQ = \sum_{m=1}^{nmos} \left(\sum_{g=1}^{ngrade} REQSTR(m,g) \right)$$

$$AGGAUT = \sum_{m=1}^{nmos} \left(\sum_{g=1}^{ngrade} AUTSTR(m,g) \right)$$

$$AGGASS = \sum_{m=1}^{nmos} \left(\sum_{g=1}^{ngrade} ASSSTR(m,g) \right)$$

AGGAVA = AGGASS * NONAVA

Table 3-1. Readiness Mnemonic Description

	Required	Authorized	Assigned	Available
Number for a specific MOS & grade	REQSTR	AUTSTR	ASSSTR	AVASTR
% - for a specific MOS & grade	AVPERE	AVPEALL		
Σ - over all MOS for each grade	AGREGR	AGAUGR	AGASGR	AGAVGR
% - over all MOS for each grade	PEREGR	PEAUGR		
Σ - over all grades for each MOS	AGREMO	AGAUMO	AGASMO	AGAVMO
% - over all grades for each MOS	MPERRE	MPERAU		
Σ - over all grades and all MOS	AGGREQ	AGGAUT	AGGASS	AGGAVA
% - over all grades and all MOS	REASPE & REAVPE	AUASPE		
C-rating - aggregate	REAVC & REASC	AUASC		
Σ - over High 5 grades for each MOS	H5REMO	H5AUMO	H5ASMO	H5AVMO
Σ - over High 5 grades & all MOS	H5REAG	H5AUAG	H5ASAG	H5AVAG
% - over High 5 grades & all MOS	H5REPE	H5AUPE		
Σ - over senior grades & all MOS	AGRESE	AGAUSE	AGASSE	AGAVSE
% - over senior grades & all MOS	AVSEPE	ASSEPE		
Σ - correct MOS, all grades & MOS			AGASOK	AGAVOK
% - correct MOS, all grades & MOS	APREOK	APAUOK		
C-rating - senior grade	AVSEC			
C-rating - aggregate only	REAVC			
C-rating - based on available	AVASC			
C-rating - based on average MOS	OKMOSC			
C-rating - overall for ISSUE/unit	ISCRAT			
Amount missed goal of MINPER	MISGOR	MISGOA		

Mnemonic Hints:

REQ & RE = Required	MO & M = MOS
AUT & AU = Authorized	PER & PE = Percentage
ASS & AS = Assigned	H5 = High Five Enlisted
AVA & AV = Available	SE = Senior Grades (E5-06)
AGG & AG = Aggregated	

(b) Next, using original assignments, grade substitutions and MOS substitutions, compute the aggregates over all MOS for each grade for each grade.

$$AGREGR(g) = \sum_{m=1}^{nmos} REQSTR(m,g)$$

$$AGAUGR(g) = \sum_{m=1}^{nmos} AUTSTR(m,g)$$

$$AGASGR(g) = \sum_{m=1}^{nmos} ASSSTR(m,g)$$

$$AGAVGR(g) = AGASGR(g) * NONAVA$$

(c) Using original assignments and both substitutions, compute the senior-grade aggregates of all grades E-5 and higher including warrant officers and commissioned officers:

$$AGRESE = \sum_{m=1}^{nmos} \left(\sum_{g=E5}^{O6} REQSTR(m,g) \right)$$

$$AGAUSE = \sum_{m=1}^{nmos} \left(\sum_{g=E5}^{O6} AUTSTR(m,g) \right)$$

$$AGASSE = \sum_{m=1}^{nmos} \left(\sum_{g=E5}^{O6} ASSSTR(m,g) \right)$$

$$AGAVSE = AGASSE * NONAVA$$

(d) Also, using original assignments and both substitutions, compute the aggregates for the five highest enlisted grades:

$$H5REAG = \left(\sum_{m=1}^{nmos} \left(\sum_{g=E5}^{E9} REQSTR(m,g) \right) \right.$$

$$H5AUAG = \left(\sum_{m=1}^{nmos} \left(\sum_{g=E5}^{E9} AUTSTR(m,g) \right) \right.$$

$$H5ASAG = \left(\sum_{m=1}^{nmos} \left(\sum_{g=E5}^{E9} ASSSTR(m,g) \right) \right)$$

$$H5AVAG = H5ASAG * NONAVA$$

(e) Using original assignments and grade substitutions, compute the aggregates that are in the correct MOS over all grades for each MOS:

$$AGREMO(m) = \sum_{g=1}^{ngrade} REQSTR(m,g)$$

$$AGAUMO(m) = \sum_{g=1}^{ngrade} AUTSTR(m,g)$$

$$AGASMO(m) = \sum_{g=1}^{ngrade} ASSSTR(m,g)$$

$$AGAVMO(m) = AGASMO(m) * NONAVA$$

(f) The final set of aggregates using the original assignments and the grade substitutions is the total number of people assigned who were assigned to the correct MOS:

$$AGASOK = \sum_{m=1}^{nmos} \left(\sum_{g=1}^{ngrade} ASSSTR \right)$$

$$AGAVOK = AGASOK * NONAVA$$

(g) Finally, using original assignments, compute the available personnel for each MOS and grade:

$$AVASTR(m,g) = ASSSTR(m,g) * NONAVA$$

(h) And using the original assignments and both substitution assignments, compute the high five aggregate for each MOS:

$$H5REMO(m) = \sum_{g=E5}^{E9} REQSTR(m,g)$$

$$H5AUMO(m) = \sum_{g=E5}^{E9} AUTSTR(m,g)$$

$$H5ASMO(m) = \sum_{g=E5}^{E9} ASSSTR(m,g)$$

$$H5AVMO(m) = H5ASMO(m) * NONAVA$$

(2) Compute Percentages. In order to compute numbers comparable to the "authorized" numbers now reported by MILPERCEN, the "authorized" percentages are computed by dividing the assigned strengths by the authorized spaces. In accordance with ARR 220-1, the "required" percentages are computed by dividing the available strengths by the required spaces.

(a) Compute the aggregate percentages:

REAVPE = (AGGAVA/AGGREQ) * 100

REASPE = (AGGASS/AGGREQ) * 100

AUAGPE = (AGGASS/AGGAUT) * 100

(b) Compute the percentages aggregated over all grades for each MOS:

MPERAU(m) = (AGASMO(m)/AGAUMO(m)) * 100

MPERRE(m) = (AGAVMO(m)/AGREMO(m)) * 100

(c) Compute the percentages aggregated over all MOS for each grade:

PEAUGR(g) = (AGASGR(g)/AGAUGR(g)) * 100

PEREGR(g) = (AGAVGR(g)/AGREGR(g)) * 100

(d) Compute the senior-grade percentages:

AVSEPE = (AGAVSE/AGRESE) * 100

ASSEPE = (AGASSE/AGAUSE) * 100

(e) Compute the percentages for the aggregate of the highest five enlisted grades:

H5AUPE = (H5ASAG/H5AUAG) * 100

H5REPE = (H5AVAG/H5REAG) * 100

(f) Compute the average percentages for personnel assigned to the correct MOS:

APREOK = (AGAVOK/AGGREQ) * 100

APAUOK = (AGASOK/AGGAUT) * 100

(g) Compute the amount the aggregate percentages missed the goal percentages:

MISGOA = AUASPE - (PERMIN * 100)

MISGOR = REASPE - (PERMIN * 100)

(3) Compute C-Ratings. First, compute the MOS C-ratings. Compute separate ratings using the authorized percentages and the required percentages. Then compute the other ratings that will be needed.

(a) Compute the average MOS C-rating, OKMOSC, using the aggregate required percentage available in the correct MOS, APREOK, and part II of Table 3-2.

(b) Repeat, computing the senior grade C-rating by comparing AVSEPE, the available senior-grade percentage, and setting AVSEC.

(c) Now changing to part I of Table 3-2, compute the aggregate C-rating by comparing REAVPE, required personnel available percentage, and setting REAVC to the C-rating.

(d) Again using part I, use REASPE, required personnel assigned percentage to set REASC.

(e) The last use of part I will be to set AUASC, using AUASPE, the authorized assigned percentage.

(f) Finally, the overall C-rating, ISCRAT, is computed by setting it equal to the lowest of the four ratings: OKMOSC, AVSEC, REAVC, and REASC computed above. AUASC will not be used in this comparison; it will be stored for later reference.

Table 3-2. Percentages for C-rating Computation

I. Aggregate strength percentages	C-rating
90% or greater	C1
80% to 89%	C2
70% to 79%	C3
less than 70%	C4
II. MOS and senior grade percentages	
85% or greater	C1
75% to 84%	C2
65% to 74%	C3
less than 65%	C4

e. Report Processor. Selection of the reports that are produced by this Processor is controlled by the report requests in the Report Request file. Many of the reports will not be needed for every run. The reports are summarized by type in Table 3-3 and are described in Section 3.3.6, Readiness Reports.

Table 3-3. PRIM Report Summary[a]

Report name	Detail or Aggregation		
	ISSUE	MOS	Grade
ISSUE Summary	D	A	A
MOS by Aggregated ISSUE	S	D	A
MOS Summary by ISSUE	D	D	A
MOS Summary by Grade	A	D	D
Grade Summary by Aggregated ISSUE	S	A	D
Grade Summary by ISSUE	D	A	D
High Five Summary by ISSUE	D	D	S
ISSUE Listing	D	D	D
C-ratings	D	A	A
Excess People	N/A	D	D
Unfilled Jobs	D	D	D

[a]D = detailed; A = aggregated; S = semiaggregated.

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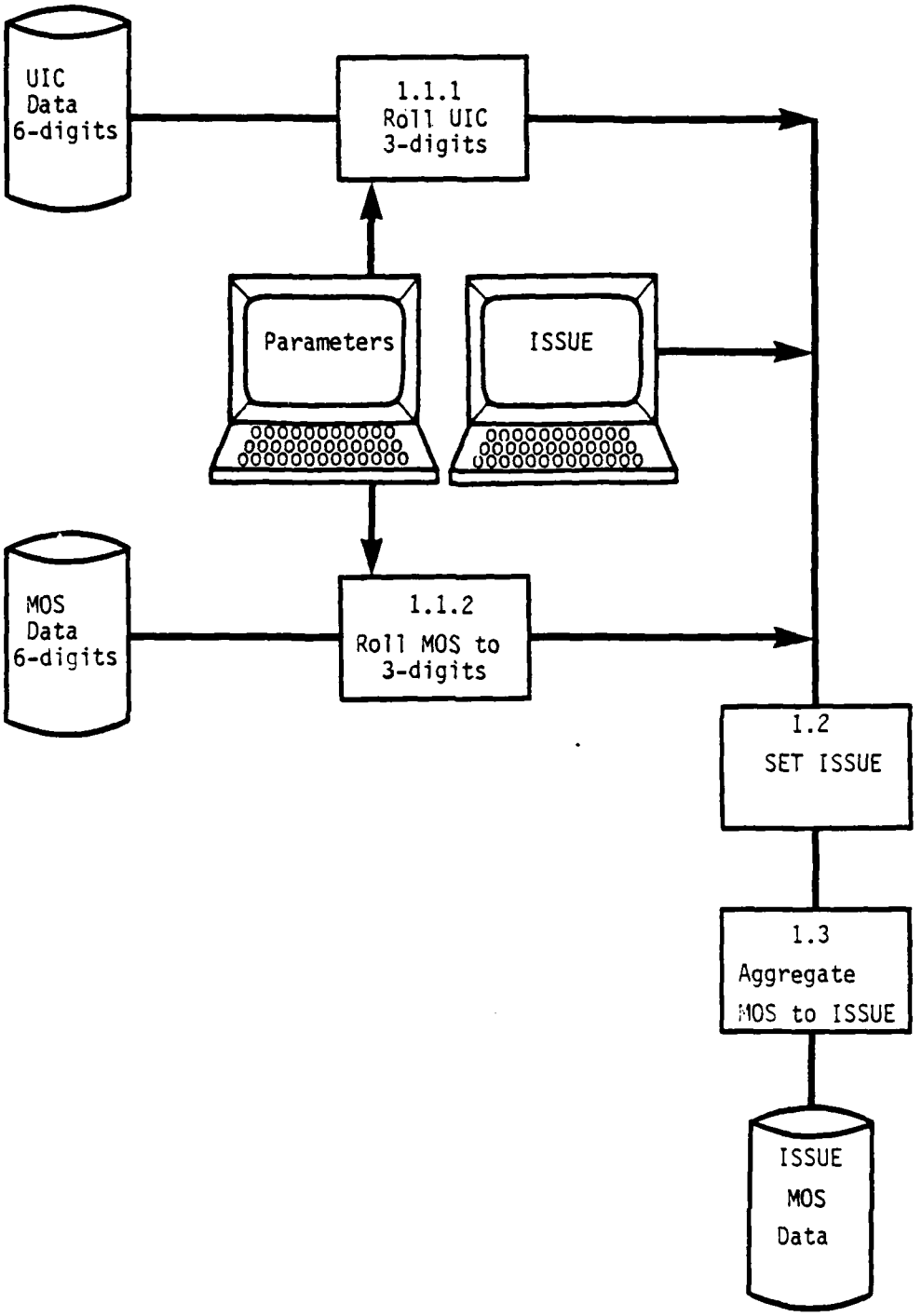

Figure 3-1. Preprocessor Organization

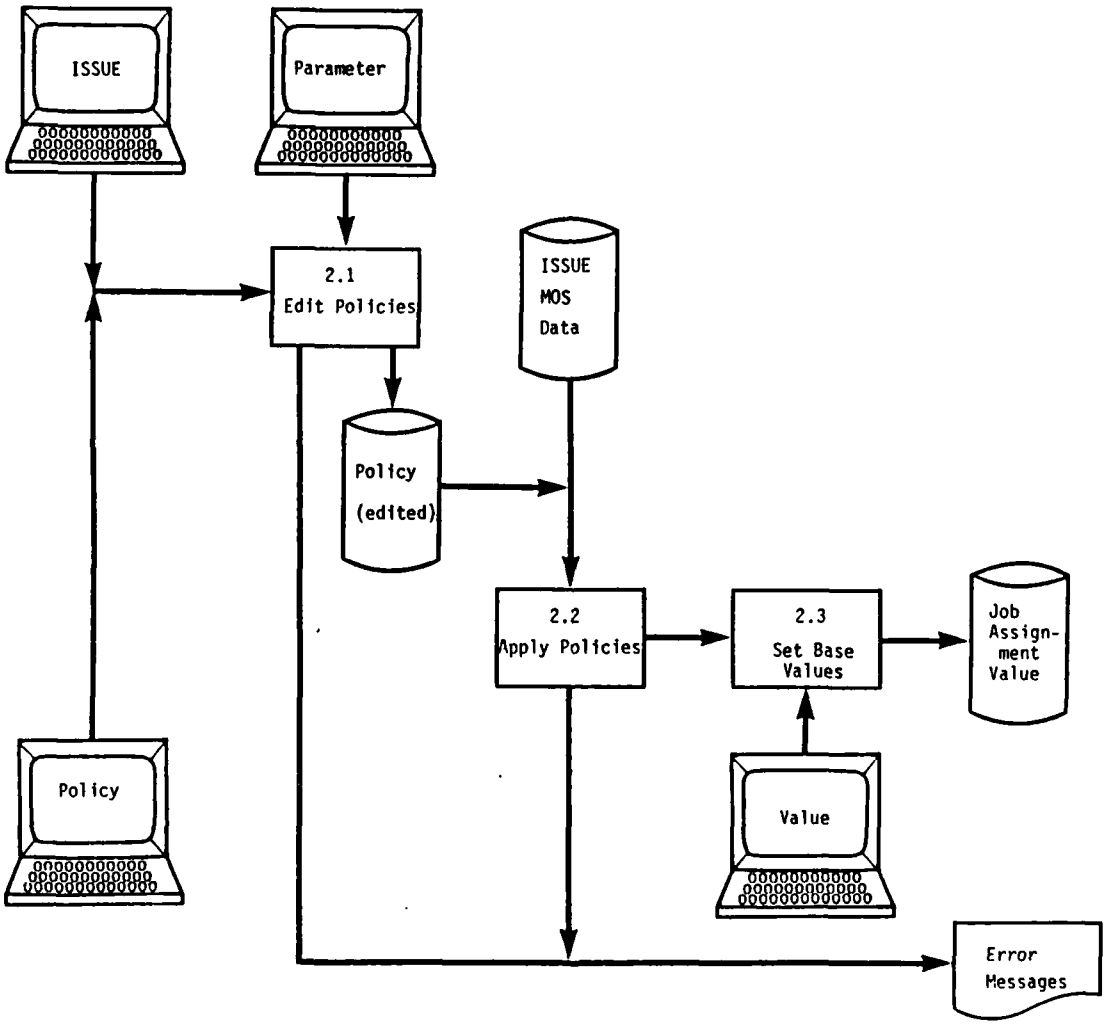

Figure 3-2. Policy Processor Organization

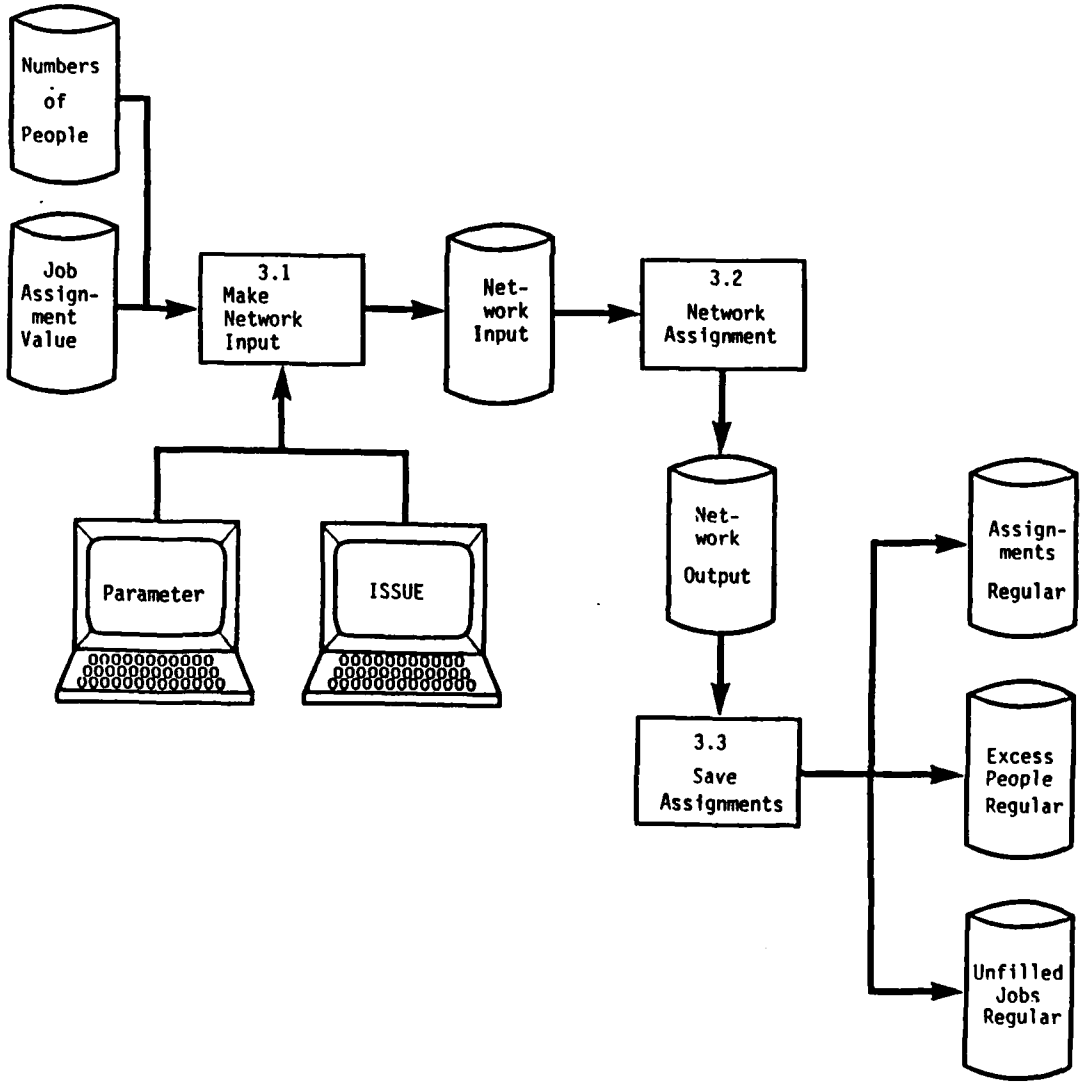

Figure 3-3. Assignment Processor Organization

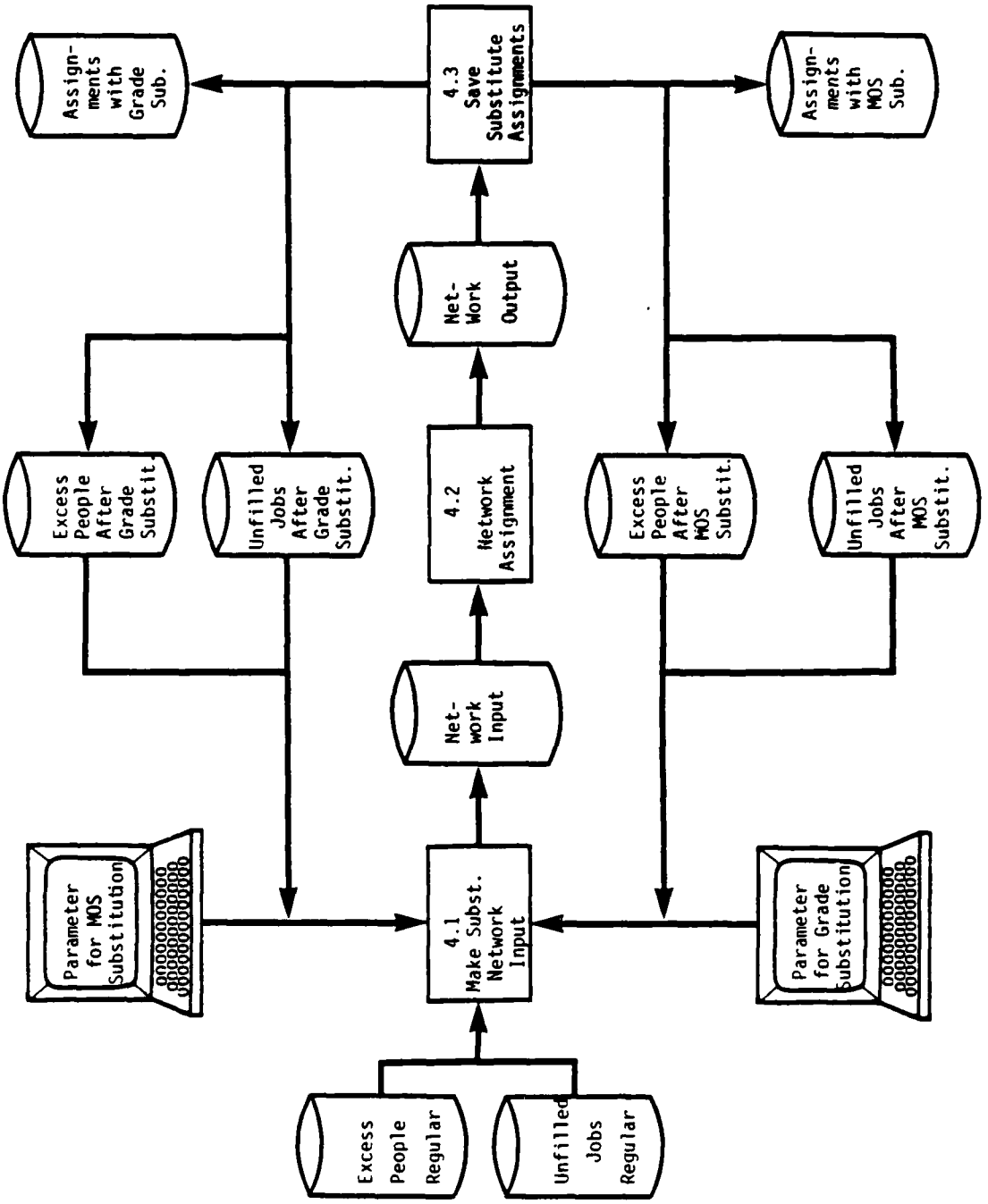

Figure 3-4. Substitution Assignment Processor Organization

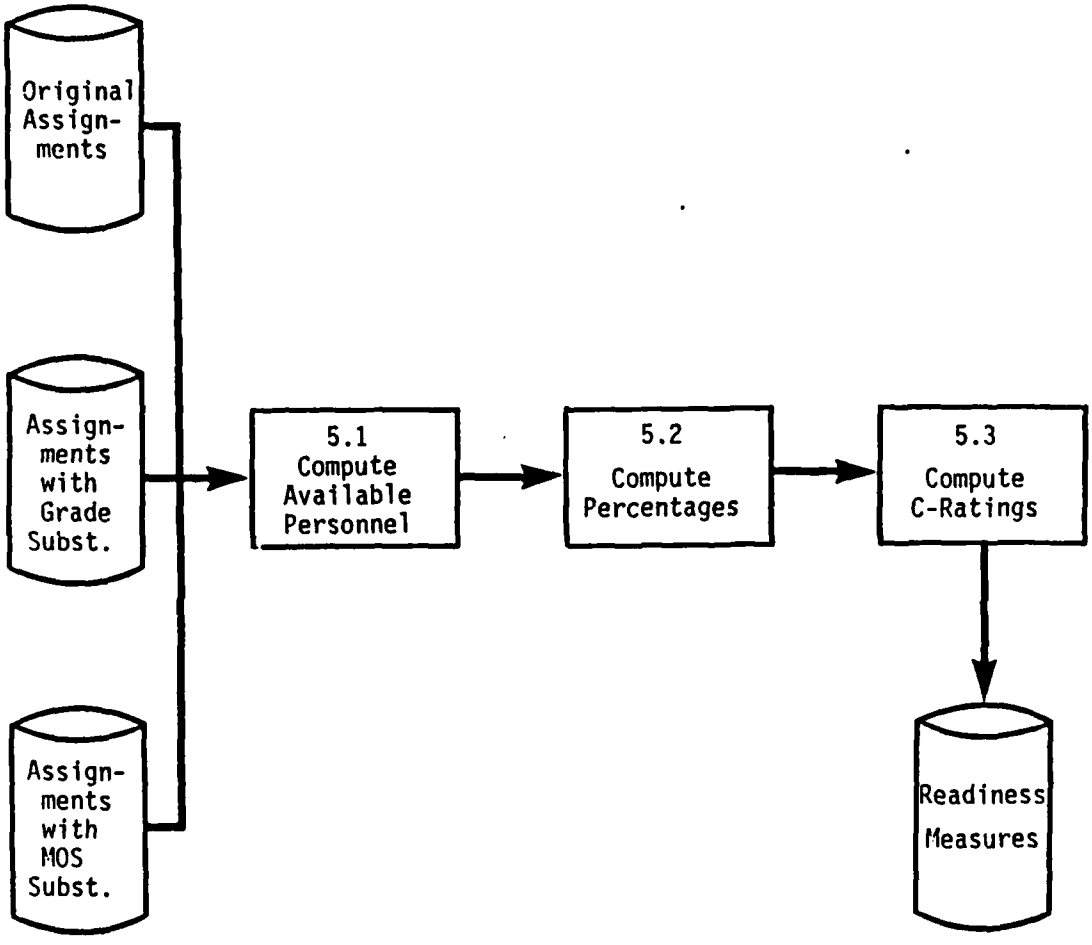

Figure 3-5. Readiness Processor Organization

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3.3 INPUTS - OUTPUTS

a. Inputs. The input data is of two types: the automated data such as the personnel inventory and the jobs that should be filled; and the manually developed files which control the model processing.

(1) Automated Data

(a) Personnel Inventory. Since the enlisted and officer data are stored separately at MILPERCEN, the personnel inventory data is a combination of three separate files. The enlisted data comes from P3M; the warrant officer data is from the WOFIP; the commissioned officer data is from the OFIP. All of these data are frequently updated by MILPERCEN and can be obtained when required.

(b) Job Data. Although MILPERCEN usually calls this data the "authorizations," PRIM has been designed to run with either the required or the authorized spaces as the PRIM job data. The set used for testing PRIM came from the AUDB data base maintained at MILPERCEN. However, if it were desired to use PRIM with a set of spaces derived from some other source, no changes would be required. The only requirement is that the job descriptions should be transferred to a file with the same format as the file used for PRIM development.

(2) Manually Developed Files. In general, PRIM is a table-driven model. The data contained in these files is developed by the user and contains the majority of the logic. Each PRIM run can, therefore, be entirely different from the prior run, or may be nearly the same with only minute differences. When a run does not perform as expected, the user should first verify that all of these manual files contain the desired data. Table 3-4 shows the manual files and the processors in which they are used. A complete description and the formats of these files are in both the PRIM Program Maintenance Manual and the PRIM User Manual.

Table 3-4. Manual Files Used by the Processors

Processor	ISSUE	Policy	Value	Parameter
Preprocessor	X			X
Policy	X	X	X	X
Assignment	X			X
Substitute Assignment			X	X
Readiness				X
Report	X			X

(a) ISSUE File. By the definitions of ISSUEs provided in this file, the user specifies the levels of unit aggregation desired, the method by which the units in each ISSUE should be identified, and the name to be used on the reports. The definitions of ISSUE must not be changed between the use of this file by the Preprocessor and the completion of all of the other processors.

(b) Policy File. This file is the file used to specify all of the policies which are stated in terms of percentage fill. Each entry in the Policy file is first identified as to the ISSUE or the MOS to which it applies. The other entries are the lowest and highest applicable grades, the minimum fill, the maximum fill, and, for the policies identified by ISSUE, whether the policy applies to all MOS within the ISSUE or to a specific MOS. The final variable specified by the user is the value that should be applied to assignments made in accordance with this policy. This file is first used with the Policy Processor.

(c) Value File. This file specifies the minimum amd maximum fill levels and the associated assignment values that should be applied to each job type. If the applicable data has previously been specified by the Policy file, the data in this file will be ignored. Any job data which has not had a policy applied, and which does not have corresponding data in this file, will be ignored. The Value file is first used with the Policy Processor.

(d) Parameter File. This file contains all of the parameters needed in addition to the ISSUE, Policy, and Value files. The Parameter file includes data such as the As-of-Date, the break points between percentages used in computing C-ratings, and the criteria used for matching people and jobs (i.e., in this first version of PRIM, the MOS and grade).

b. Outputs. PRIM creates several types of output. Within each type of output, there are several files. Only the major types and the printed readiness reports will be described here; a complete description of the mass storage files is in the PRIM Program Maintenance Manual and the PRIM User Manual.

(1) Mass Storage Files

(a) Assignment Files. A set of files of assignments made is created by the Assignment Processor and Substitute Assignment Processor. These files are annotated to identify each record by assignment type, i.e., original assignment, MOS substitution assignment, or grade substitution assignment.

(b) Excess People Files. These files are created by the Assignment Processor and Substitute Assignment Processor. Each file is used to create data for the next set of cycles through the Substitute Assignment Processor and saved for later use in reports.

(c) Unfilled Jobs Files. Similar to the excess people files; these files are created by the Assignment Processor and Substitute Assignment Processor, used to create data for the next set of cycles through the Substitute Assignment Processor, and saved for later use in reports.

(d) Readiness Files. The Readiness Processor uses the assignment files to create all of the readiness indicators used in the reports. The files containing the readiness indicators are available for use in creating additional reports.

(2) Readiness Reports. The formatted readiness reports designed for use by the MILPERCEN analyst are described in this subsection. In order to show relative lengths of each report, a page estimate is included which is based on an estimated 400 MOS and 100 ISSUEs. The length will change when there are a different number of ISSUEs or MOS or when the aggregation levels differ substantially from those used during PRIM tests. These reports use the data from the Readiness Processor. As an aid to the user, the sample reports in this section have the relevant mnemonic entered in the space reserved for numbers in the actual report.

(a) ISSUE Summary

Description: This report displays the numbers of personnel and the percentages most frequently used by MILPERCEN. They are displayed at the ISSUE level and aggregated over all MOS and grades.

Utilization: This report provides the user with an overall picture of the assignments.

Sample output: See Figure 3-6.

Estimated length: 3 pages.

PRIM MODEL ISSUE SUMMARY PAGE 1

ISSUE	CODE	REQUIRED	AUTHORIZED	ASSIGNED	AVAILABLE	MINIMUM PERCENT	GOAL NUMBER	% ASSIGN /AUTH	% ASSIGN / REQ	% AVAIL / REQ	% GOAL ASSIGN
CONUS(OTHER)	COO	AGGREQ	AGGAUT	AGGASS	AGGAVA	PERMIN	MINPER* AGGAUT	AUASPE	REASPE	REAVPE	AGGASS/ GOAL NUMBER
ARMY SECR	CO1										
ARMY STAFF	CO2										
.											
.											
.											
TOTAL											
USAREUR	EOO										
1ST ARM DIV	EO1										
.											
.											
.											
OTHER USAREUR											
4TH MECH-EUR											
2D MECH-EUR											
1ST MECH-EUR											
		-------	-------	-------	-------	-------	-------	------	-------	-----	-----
SUBTOTAL											
		=======	=======	=======	=======	=======	=======	======	=======	=====	=====
TOTAL											
.											
.											
.											
		=======	=======	=======	=======	=======	=======	======	=======	=====	=====
GRAND TOTAL											

Figure 3-6. ISSUE Summary

(b) Specialty Summary by Aggregated ISSUE

Description: This report displays, for each MOS, the number of personnel required, authorized, assigned, and available plus some of the relevant percentages. Within the MOS, the report is summarized to the highest level of ISSUE. This report contains the same data as the subtotal lines of the MOS Summary by ISSUE and is much shorter than that report.

Utilization: This report provides the user with an overall picture of the MOS percentage fills at the aggregation level which is normally equated to MACOM.

Sample output: See Figure 3-7.

Estimated length: 10 pages.

P R I M MODEL — SPECIALTY SUMMARY BY — Page 1

TEST RUN 1 — AGGREGATED ISSUE — ASOF 30SEP84

MOS: 11B000000	REQ	AUTH	ASSIGN	AVAIL	ASSIGN / Auth	AVAIL / Req
CONUS-OTHER	AGREMO	AGAUMO	AGASMO	AGAVMO	MPERAU	MPERRE
EUROPE						
FORSCOM						
.						
.						
.						
WESTCOM						
TOTAL						
MOS: 11E000000						
CONUS-OTHER						
EUROPE						
FORSCOM						
.						
.						
.						
WESTCOM						
TOTAL						

Figure 3-7. Specialty Summary by Aggregated ISSUE

(c) Specialty Summary by ISSUE

Description: This report displays a summary over all grades of the MOS fills of each ISSUE. Since this report lists every ISSUE for every MOS and SC, this report could be extremely long.

Utilization: This report provides the user with an MOS summary picture of the different fills obtained for each ISSUE.

Sample output: See Figure 3-8.

Estimated length: 500 pages.

P R I M MODEL — SPECIALTY SUMMARY — Page 1

TEST RUN 1 — BY ISSUE — ASOF 30SEP84

MOS: 11B0000000	REQ	AUTH	ASSIGN	AVAIL	ASSIGN / AUTH	AVAIL / REQ
ADJ GEN CMP SYS CMD	AGREMO	AGAUMO	AGASMO	AGAVMO	MPERAU	MPERRE
.						
.						
.						
TOTAL - CONUS						
FORSCOM						
FT. BENNING						
FT. BRAGG						
FT. CARSON						
.						
.						
.						
TOTAL - FORSCOM						
.						
.						
.						
WESCOM						
.						
.						
.						
GRAND TOTAL						

Figure 3-8. Specialty Summary by ISSUE

(d) Specialty Summary by Grade

Description: This report displays a summary over all ISSUEs for each MOS and grade.

Utilization: This report provides the user with an overall picture of the MOS and grade percentage fills.

Sample output: See Figure 3-9.

Estimated length: 75 pages.

P R I M MODEL SPECIALTY SUMMARY Page 1

TEST RUN 1 BY GRADE ASOF 30SEP84

	E3	E4	E5	.	.	.	05	06
11B------								
REQUIRED	REQSTR							
AUTHORIZED	AUTSTR							
ASSIGNED	ASSSTR							
AVAILABLE	AVASTR							
ASSIGN/AUTH	ASSSTR/AUTSTR							
AVAIL /AUTH	AVASTR/AUTSTR							
AVAIL /REQ	AVASTR/REQSTR							
11D								
REQUIRED								
AUTHORIZED								
ASSIGNED								
AVAILABLE								
ASSIGN/AUTH								
AVAIL /AUTH								
AVAIL /REQ								
11E								
REQUIRED								
AUTHORIZED								
ASSIGNED								
AVAILABLE								
ASSIGN/AUTH								

Figure 3-9. Specialty Summary by Grade

(e) Grade Summary by Aggregated ISSUE

Description: This report displays a summary of the total fill by grade summarized at the highest level of ISSUE (frequently this level is equated to MACOM).

Utilization: This report provides the user with a summary picture of the match between grade requirements by MACOM or other major ISSUE level and the ability to meet that requirement. This report contains the data shown on the subtotal lines of the following report; this report will be the shortest of the two grade reports.

Sample output: See Figure 3-10.

Estimated length: 3 pages.

P R I M MODEL GRADE SUMMARY BY Page 1

TEST RUN 1 AGGREGATED ISSUE ASOF 30SEP84

GRADE: E1

	REQ	AUTH	ASSIGN	AVAIL	ASSIGN / AUTH	AVAIL / REQ
CONUS-OTHER	AGREGR	AGAUGR	AGASGR	AGAVER	PEAUGR	PEREGR
EUROPE						
FORSCOM						
.						
.						
.						
WESTCOM						
TOTAL						

GRADE: E2

CONUS-OTHER
EUROPE
FORSCOM
.
.
.
WESTCOM
TOTAL

Figure 3-10. Grade Summary by Aggregated ISSUE

(f) Grade Summary by ISSUE

Description: This report displays a summary of the fill by grade of each ISSUE. This report contains the aggregates by grade data from the ISSUE Listing Report (see Section 3.3.2.2.8).

Utilization: This report provides the user with a summary of the grade levels of the fill within each ISSUE.

Sample output: See Figure 3-11.

Estimated length: 50 pages.

P R I M MODEL GRADE SUMMARY BY Page 1

TEST RUN 1 ISSUE ASOF 30SEP84

GRADE: E1

	REQ	AUTH	ASSIGN	AVAIL	ASSIGN / AUTH	AVAIL / REQ
CONUS-OTHER	AGREGR	AGAUGR	AGASGR	AGAVGR	PEAUGR	PEREGR
ADJ GEN						
CMP SYS CMD						
.						
.						
.						
TOTAL-CONUS						
FORSCOM						
FT BENNING						
FT BRAGG						
FT CARSON						
A						
B						
SUBTOTAL =						
TOTAL-FORSCOM						
.						
.						
WESTCOM						
GRAND TOTAL						

Figure 3-11. Grade Summary by ISSUE

(g) High Five Summary by ISSUE

Description: This report displays a summary of the fill of the top five enlisted grades by ISSUE. This report is the same as the ISSUE Summary except that only the top five enlisted grades are included.

Utilization: This report provides the user with a summary of the distribution, by ISSUE, of the aggregate of the highest five enlisted grades.

Sample output: See Figure 3-12.

Estimated length: 3 pages.

PRIM MODEL HIGH FIVE SUMMARY BY ISSUE PAGE 1

TEST RUN 1 ASOF 30SEP84

ISSUE	CODE	REQUIRED	AUTHORIZED	ASSIGNED	AVAILABLE	MINIMUM PERCENT	GOAL NUMBER	% ASSIGN /AUTH	% ASSIGN / REQ	% AVAIL / REQ	% ASSIGN GOAL
CONUS(OTHER)	COO	H5REAG	H5AUAG	H5ASAG	H5AVAG	MINPER	MINPER	H5AUPE	H5ASAG/	H5REPE	H5ASAG/
ARMY SECR	C01						*		H5REAG		GOAL
ARMY STAFF	C02						H5AUAG				NUMBER
.											
.											
.											
TOTAL											
USAREUR	EOO										
1ST ARM DIV	E01										
.											
.											
.											
OTHER USAREUR											
4TH MECH-EUR											
2D MECH-EUR											
1ST MECH-EUR											
		-------	-------	-------	-------	-------	-------	------	-------	-----	-----
SUBTOTAL											
		-------	-------	-------	-------	-------	-------	------	-------	-----	-----
TOTAL											
.											
.											
.											
		======	======	======	======	======	======	======	======	=====	=====
GRAND TOTAL											

Figure 3-12. High Five Summary by ISSUE

(h) ISSUE Listing

Description: This report displays a detailed description of the fill by MOS and grade of each ISSUE. This report is the longest report.

Utilization: This report allows the user to answer detailed questions about the manner by which each individual ISSUE was filled.

Sample output: See Figure 3-13.

Estimated length: 200 pages for each ISSUE.
All = 20,000 pages.

P R I M MODEL — PAGE 1

ISSUE LISTING

	REQUIRED	AUTHORIZED	ASSIGNED	AVAILABLE	ASSIGN /AUTH	AVAIL /REQ
AGGREGATE	AGGREQ	AGGAUT	AGGASS	AGGAVA	AVASPE	REAVPE
HIGH FIVE	H5REAG	H5AUAG	H5ASAG	H5AVAG	H5AUPE	H5REPE
SENIOR	AGRESE	AGAUSE	AGASSE	AGAVSE	ASSEPE	AVSEPE
E1 . . E9						
WO	AGREGR	AGAUGR	AGASGR	AEAUGR	REAUGR	PEREGR
01 . . 06						
MOS =						
AGGREGATE	AGREMO	AGAUMO	AGASMO	AGAVMO	MPERAU	MPERRE
HIGH FIVE	H5REMO	H5AUMO	H5ASMO	H5AVMO		
E1 . . E9	REQSTR	AUTSTR	ASSSTR	AVASTR	ASPEAU	AVPERE
. . 06						
MOS =						

Figure 3-13. ISSUE Listing

(i) C-Rating

Description: This report displays each of the C-ratings computed for each ISSUE. C-ratings displayed are the MOS C-rating, Senior-grade C-Rating, Aggregate C-rating, and the overall C-rating.

Utilization: This report allows the user to compare the C-ratings as they would be computed in the field with the personnel distribution criteria used by MILPERCEN.

Sample output: See Figure 3-14.

Estimated length: 2 pages.

PRIM MODEL C-RATINGS Page 1

TEST RUN 1 ASOF 30SEP84

	MOS	SENIOR GRADE	AVAILABLE	OVERALL
CONUS				
ARMY SECRETARY	OKMOSC	AVSEC	REAVC	ISCRAT
ARMY STAFF				
USAREC				
USMA				
.				
.				
.				
USAREUR				
1ST ARM DIV				
3D ARM DIV				
8TH INF DIV				
FORSCOM				

Figure 3-14. C-Rating

(j) Excess Personnel

Description: The personnel that were not assigned by the first set of passes through the Assignment Processor, i.e., prior to the MOS and grade substitution runs, are reported by MOS and grade.

Utilization: This report allows the user to identify those personnel which will require assignment outside their MOS unless action is taken to change the projected inventories. The user may also look at the number of personnel that were after either substitution assignment.

Sample output: See Figure 3-15.

Estimated length: 5 pages.

PRIM MODEL — EXCESS PERSONNEL REPORT BY MOS AND GRADE — Page 1

TEST RUN 1 — ASOF 30SEP84

AFTER MOS SUBSTITUTION

MOS	E1	E2	E3	E4	E5	E6	E7	E8	E9	WO	01	02	03	04	05	06
11B000000																
11C000000								NUMEXC								
11D000000																
11E000000																
.																
.																
.																
TOTAL																

Figure 3-15. Excess Personnel Report

(k) Unfilled Jobs

Description: The jobs that were not assigned by the first set of passes through the Assignment Processor are reported by ISSUE, MOS, and grade.

Utilization: This report allows the user to identify those Army jobs that will not be filled other than by the incorrect MOS and/or grade unless action is taken. The user may also look at the jobs that were not filled after execution of either type of substitute assignment.

Sample output: See Figure 3-16.

Estimated length: The possible, but not probable, length of this report is (100 * 400)/50, or 800 pages.

PRIM MODEL — UNFILLED JOB REPORT BY ISSUE, MOS, AND GRADE — Page 1

TEST RUN 1 — ASOF 30SEP84

ISSUE	MOS	E1	E2	E3	E4	E5	E6	E7	E8	E9	WO	O1	O2	O3	O4	O5	O6
C01	11B000000			3	2		1			4	3				3	2	
C01	11C000000			1	1			1		1	1				1		
.																	
.																	
.																	
C02	11B000000			1				1			1				1	2	
C02	11C000000																
.																	
.																	
.																	

Figure 3-16. Unfilled Job Report

3.4 DATA CHARACTERISTICS. The specifications for the mass storage files created by PRIM are included in the PRIM Program Maintenance Manual and the PRIM User Manual. These specifications include the record size, descriptions of the data elements, element type, length, and locations.

3.5 FAILURE CONTINGENCIES. Failure contingencies are discussed in the appropriate sections of the PRIM User Manual.

Section 4. ENVIRONMENT

4.1 EQUIPMENT ENVIRONMENT. PRIM is resident on a UNIVAC 1100/82 Time-sharing Multiprocessing System at the US Army Military Personnel Center (MILPERCEN). Access to the MILPERCEN system is provided through terminal devices located in the work areas of the MILPERCEN analysts. PRIM draws significantly on available system main and mass memory resources during execution. As a result, it will be necessary to anticipate and schedule the run workload into the overall run mix in order to maintain satisfactory throughput.

4.2 SUPPORT SOFTWARE ENVIRONMENT. In the event that any changes to the model code are to be made, PRIM requires the availability of the UNIVAC ASCII FORTRAN compiler, the associated subroutines, and the system collector. Assuming upward compatibility of the software system revisions, any level subsequent to the 10R1 level of the FORTRAN compiler should be compatible with the code. PRIM requires the use of the UNIVAC utility processor, SORT, level 13, or a version compatible with level 13.

4.3 INTERFACE. PRIM accepts and generates mass storage files. Any interface with other systems should be through these files.

4.4 SECURITY AND PRIVACY

a. Security. PRIM, consisting of its six processors, is UNCLASSIFIED. All PRIM outputs and output reports are UNCLASSIFIED.

It is possible that the specification of ISSUEs may require inclusion of CLASSIFIED data. The user must assure that an ISSUE file that contains CLASSIFIED data, and all runs that use the ISSUE file, is properly protected. If the report names of the ISSUEs in the ISSUE file are created to be CLASSIFIED, all output, except possibly the Error Print file, will be CLASSIFIED.

b. Privacy. The personnel data used as input to PRIM is output of an inventory projection model and does not contain information on individual people. Therefore, this section is not applicable.

APPENDIX A

THE ISSUE OF A PRIM ISSUE

A.1 DEFINITION. An ISSUE is any collection of one or more units in which the Military Personnel Center is interested. Although an ISSUE is usually a division or a CONUS installation, units may be collected into any desired grouping which will respond to the requirements of the MILPERCEN analyst. Since PRIM distributes the personnel inventory to user-defined ISSUEs rather than to individual units, the major restriction on an ISSUE specification is that the policies modeled must apply equally to all units included. There is no restriction on the number of ISSUEs to which a PRIM policy applies.

A.2 SPECIFICATION METHOD. ISSUEs are defined by the user in a file called the ISSUE file by specifying specific values of the troop program sequence number (TPSN), the unit location code (LOCCO), the station code (STACO), the owning organization (AGSMT), or the first character of the ASGMT code. If the user is unable to determine a unique set within the legal combinations of these variables which will select the desired units, the individual unit identification codes (UIC) may be listed. The UIC identification method requires a separate input line for each unit. Table A-1 shows the valid variable combinations; the order in the table is the processing sequence.

Table A-1. ISSUE Identification

Identification method 1	Identification method 2	Reset if previously set	Application errors
TPSN	ASGMT	N/A	--
TPSN	LOCCO	Yes	Not unique
TPSN	STACO	Yes	Not unique
TPSN	--	Yes	Not unique
UIC	--	Yes	Not unique
ASGMT	LOCCO	No	--
ASGMT	STACO	No	--
ASGMT	--	No	--
ASGMT1	--	No	--

A.3 AGGREGATION LEVELS. The user specifies the aggregation levels desired by the code use. The code is a four-character, alphanumeric field.

a. The first character specifies the highest (most) aggregation other than total Army; all ISSUEs which should be included in the same aggregation should begin with the same first character. This level will frequently be major command, but the user may specify the titles for this aggregation level.

b. The second and third characters delineate the second aggregation level; each unique combination of two characters will be the second aggregation level. This level is frequently used to specify CONUS installations or divisions, but the user may specify it to be MACOM or battalion. An example of this use is using F04- to represent Fort Hood, and F04A and F04B to represent 1st ACR and 2nd Arm Div repectively, both of which are located at Fort Hood.

c. The lowest aggregation level is indicated by the fourth character usuallly it is a dash (-). When the ISSUE should be aggregated into another ISSUE which has the same first three characters, the fourth character should normally be alphabetic or numeric. If it is the one of the set that has the name by which the aggregation set should be called (see F04-, F04A, and F04B above), the fourth character should be a dash (-).

APPENDIX B

MATHEMATICAL FORMULATION OF NETWORK PLANNING MODEL*

The mathematical formulation of the personnel planning problem uses the following notation:

l = number of primary personnel categories,

m = number of primary jobs,

x_{ijk} = number of FTEs from personnel category i, subcategory k, assigned to primary job j, subcategory k,

u_{ij} = desirability of assigning personnel i to job j,

$\underline{r}_i(\bar{r}_i)$ = minimum (maximum) number of FTE available in personnel category i,

$\underline{s}_{ik}(\bar{s}_{ik})$ = minimum (maximum) number of FTE available in personnel category i, subcategory k,

$\underline{a}_j(\bar{a}_j)$ = minimum (maximum) number of FTEs needed to accomplish job j,

$\underline{b}_{jk}(\bar{b}_{jk})$ = minimum (maximum) number of FTEs needed to accomplish job j, subcategory k,

J_i = set of primary job categories available for personnel type i,

I_j = Set of personnel types that can be assigned to job j,

K_i = set of subcategories that are relevant to personnel type i,

K_j = set of subcategories that are relevant to job j.

The network model can now be written:

$$\text{Maximize} \quad \sum_{i=1}^{l} \left(\sum_{j \in J_i} \sum_{k \in K_i} u_{ij} x_{ijk} \right) \quad \text{subject to}$$

$$\underline{r}_i \leq \sum_{j \in J_i} \sum_{k \in K_i} x_{ijk} \leq \bar{r}_i \quad i=1,\ldots,l$$

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*Source: Mulvey, John M., "Personnel Models with Multiple Objectives, Research Report, Princeton University, 1984.

$$\underline{s}_{ik} \leq \sum_{j \epsilon J_i} x_{ijk} \leq \bar{s}_{ik} \quad i=1,\ldots,l;\ k \epsilon K_i$$

$$\underline{a}_j \leq \sum_{i \epsilon I_j} \sum_{k \epsilon K_j} x_{ijk} \leq \bar{a}_j \quad j=1,\ldots,m$$

$$\underline{b}_{jk} \leq \sum_{i \epsilon I_j} x_{ijk} \leq \bar{b}_{jk} \quad j=1,\ldots,m;\ k \epsilon K_j$$

$$0 \leq x_{ijk} \quad i=1,\ldots,l;\ j \epsilon J_i;\ k \epsilon K_i$$

One important advantage of the formulation is that the constraint set can be represented as a pure network; hence, the problem is unimodular. This means that the optimal (and any intermediate) solution will be naturally integer-value as long as the lower and upper bounds in the constraints are integer-valued.

END

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